



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Melanie KLASSEN-MEMMER et al.

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Examiner: Shean Chiu Wu

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Title: LIQUID-CRYSTAL MEDIUM, AND ELECTRO-OPTICAL DISPLAY CONTAINING
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TC 1700DECLARATION UNDER 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Dr. Melanie Klasen-Memmer, being duly warned, declare that:

I am a citizen of Germany, residing in Heuchelheim, Germany.

I am an inventor of the above-captioned application and am familiar with the invention described therein, with the grounds for rejection made against the claims of the application in the Office Action mailed August 15, 2003, from the U.S. Patent and Trademark Office, and with the references cited as supporting the rejection.

The following experiments were conducted by me or under my supervision:

Example A and Comparative Example A

The mixture according to Example 45 at col. 239 of U.S. Patent No. 6,190,576 ("Andou") was obtained with the sole exception that the compound denoted as 5-HBCF2OB(2F,3F)-O2 by Andou with a pentyl terminal group was replaced by the corresponding compound with a propyl group [giving 3-HBCF2OB(2F,3F)-O2 by the Andou terminology] because the pentyl compound was not available to us. In the terminology of the instant application, this compound would be CPQY-3-O2, i.e., with a cyclohexyl and phenyl ring on the left side bridged from the phenyl through a CF₂O bridge to the phenyl ring having

2,3-difluoro substitution. The clearing point, rotational viscosity, optical anisotropy (Δn) and dielectric anisotropy ($\Delta \epsilon$) properties of this mixture, denoted "Comparative Example A" were determined by well known methods and are shown in the following table.

An identical mixture was provided except that the 3-HBCF₂OB(2F,3F)-O₂ compound was replaced by CQPY-5-O₂ [5-HCF₂OBB(2F,3F)-O₂ according to the Andou terminology]. This compound falls within our formula I-4 of claim 1 of the above-captioned application. The same properties of this mixture, denoted "Example A" are compared side-by-side in the following table.

The CQPY-5-O₂ compound according to the invention differs from the CPQY-3-O₂ comparative compound in that the CF₂O bridging group is between the cyclohexyl and phenyl ring rather than between the two phenyl rings [note the different order of the respective letters Q and P in the abbreviations of the compounds]. Because of the unavailability of Andou's pentyl compound, it also differs in the terminal group being propyl instead of pentyl but this latter difference would not have been expected to significantly alter the nematic phase range properties of the compound or mixture containing it. In fact, the data of Andou's Example 45 compared to the data for Comparative Example A below demonstrate that the differences in clearing point are only minor. This shows that the difference in nematic phase range properties between Example A and Comparative Example A is almost solely due to the different position of the bridging group rather than the pentyl/propyl difference.

Example	Characterist. Compound	Clearing Point	Rotational Viscosity, γ_1	Optical anisotropy, Δn	Dielectric anisotropy, $\Delta \epsilon$
Example A	CQPY-5-O ₂	86.5°C	237 mPa·s	0.099	-2.1
Comparative Example A	CPQY-3-O ₂	79.5°C	209 mPa·s	0.095	-1.9
Andou Example 45	CPQY-5-O ₂	80.1°C	ND	0.092	-1.8

*ND denotes that no determination has been made.

An additional test was conducted to determine the crystallization temperature of these liquid crystal media, i.e., the minimum of the nematic phase range. The medium of Comparative Example A crystallized at ambient temperature over night, which means this mixture is not practically useful in LC displays. The medium of Example A showed long term stability for at least 1,000 hours at a temperature of -20°C in test cells, a significantly

advantageous property for LC display use.

These data are in accordance with the general statement in the disclosure of our application as to the advantageous broad range of the nematic phase for the inventive liquid crystal media; see, for example, page 3, lines 10-14, and page 27, lines 18-21. Such advantageous properties could not have been expected when compared to the properties of the Andou comparative composition which has a much narrower range of nematic phase in view of the significantly lower clearing point and the much higher crystallization point.

Example B and Comparative Example B

In a manner similar to Example A, the mixture according to Example 9 of our application was prepared and an identical mixture differing by containing the compound CPQY-3-O2 in place of CPQY-5-O2 according to the invention was prepared. The clearing point, rotational viscosity, Δn and $\Delta \epsilon$ properties of these mixtures, denoted "Example B" and "Comparative Example B" were determined by well known methods and are shown in the following table.

Example	Characterist. Compound	Clearing Point	Rotational Viscosity, γ_1	Optical anisotropy, Δn	Dielectric anisotropy, $\Delta \epsilon$
Example B	CPQY-5-O2	86.5°C	262 mPa·s	0.108	-5.2
Comparative Example B	CPQY-3-O2	78.0°C	ND	0.105	-5.2

*ND denotes that no determination could be made due to the crystallization discussed below.

As in Example A and Comparative Example A, an additional test was conducted to determine the crystallization temperature of these liquid crystal media. The medium of Comparative Example B crystallized at ambient temperature over night, which means this mixture is not practically useful in LC displays. The medium of Example B showed long term stability in test cells for at least 1,000 hours at a temperature of -20°C, for above 800 hours at -30°C and for above 500 hours at -40°C.

Again, such advantageous properties are in accordance with our disclosure and could not have been expected when compared to the properties of the Andou comparative composition.

Example C and Comparative Example C

A mixture according to Example 10 of our application was provided. This composition contains the compound CQY-5-O2 [in the terminology of the instant application] which is according to formula I-1 of claim 1, i.e., with a cyclohexyl on the left side bridged through a CF₂O bridge to the phenyl ring having 2,3-difluoro substitution. The clearing point, rotational viscosity, Δn and $\Delta \epsilon$ properties of this mixture, denoted "Example C" were determined by well known methods and are shown in the following table.

An identical mixture was prepared except that the CQY-5-O2 was replaced with PQY-5-O2 wherein the cyclohexyl ring is replaced with a phenyl ring. Thus, this compound is similar to the 3-BCF2OB(2F,3F)-O2 compound of Andou cited in the Office Action as being one of the closest compounds. The same properties of this mixture, denoted "Comparative Example C" are compared side-by-side in the following table.

Example	Characterist. Compound	Clearing Point	Rotational Viscosity, γ_1	Optical anisotropy, Δn	Dielectric anisotropy, $\Delta \epsilon$
Example C	CQY-5-O2	70.0°C	130 mPa·s	0.101	-3.3
Comparative Example C	PQY-5-O2	61.0°C	115 mPa·s	0.101	-3.3

These data show that the cyclohexyl group and phenyl group are not functionally equivalent. The same mixture with a compound having the cyclohexyl group according to our claims exhibits a significantly higher clearing point (and, thus, advantageous nematic range) than the same mixture with a compound which replaces the cyclohexyl with phenyl. Such advantageous properties could not have been expected when compared to the properties of the Andou comparative composition.

Example D and Comparative Example D

The mixture according to Example 5 of our application (which is not according to our

current claims) was provided and the clearing point determined as Comparative Example D.

As stated in our application, the clearing point was 70.5°C.

An identical mixture was prepared except that the total concentration of 10% each of the two compounds CPQIY-3-O4 and CPQIY-5-O4 were replaced by 20% of the single compound CQPY-5-O2. This modified mixture, Example D, falls within our current claims. The change in the mixture to provide the compound according to our claims resulted in increasing the clearing point of the mixture to 82.0°C, a significant improvement in the nematic range.

These data further demonstrate an unexpected advantage of our claimed invention. The prior art provides no expectation that the medium with a compound having a sole cyclohexyl group left of the CF₂O bridge would have an advantageous clearing point in comparison to an identical medium with compounds having a cyclohexyl and phenyl group left of the CF₂O bridge.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 13.01.2004

Melanie Klasen-Memmer

Dr. Melanie Klasen-Memmer